

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claim 4 has been canceled. Claim 1 has been amended to further recite that the sputtering target is prepared by the butt joining of metal sheets being made of the same “spray formed” material. Basis for this is found at lines 7-11 of page 16 in the specification, which describes that the metallic material used in the production of a sputtered target is preferably prepared by spray forming because the metallic material then has a more uniform composition as compared with materials prepared by casting or powder molding. Moreover, the “spray forming” recitation must be considered to be a limitation in the apparatus claims because spray forming imparts distinctive structural characteristics to the final product (M.P.E.P. §2113), i.e., a more uniform composition as compared with materials prepared by casting or powder molding.

Applicants wish to thank Examiners Fogarty and King for the courtesy of an interview on May 27, 2009 at which time the outstanding Office Action and the claims as amended according to the present response were discussed. No agreement was reached at that time since the “spray formed” limitation had not previously been considered. Applicants nonetheless respectfully submit that the amended claims define over the cited prior art.

As was explained in the interview, it is only through the use of the present invention that a sputtering target having adequately uniform composition and metallographic characteristics may be prepared by butt joining of metal sheets. Forming a film by sputtering must be performed without abnormal discharge in order for the film to have a uniform composition and thickness. This requires that the sputtering target also has a uniform composition, metallographic structure and the like. This requirement conventionally made it impractical to form a large sputtering target by joining metal sheets of the same material because the divergent metallographic characteristics of the intermetallic compound at the

joint portion resulted in arcing during the sputtering process and insufficient uniformity in the resulting layer.

The present invention is based upon the recognition that friction stir welding (FSW) reduces the divergence of the metallographic characteristics in the joint portion sufficiently for its use in joining the materials of a sputtering target, particularly where annealing is performed on the target after the FSW. Evidence of criticality for this is found at pages 18-25 of the specification which describes tests performed on examples of sputtering targets prepared by joining the target materials with FSW, both with and without annealing, and a comparative example wherein the joining is by electron beam welding. As is described on page 25 of the specification, it was found that the rate of abnormal discharges during sputtering was larger in the comparative example than in the example where the target materials were joined by FSW. Moreover, the trace of the rotating tool was reduced in the samples subjected to annealing (page 23, lines 5-8).

As was also explained in the interview, none of the prior art cited in the rejection, i.e., Rhodes et al and Pao et al, is directed to a sputtering target formed using FSW. Instead, Pao et al is directed to materials for aircraft bodies (see introduction) and Rhodes et al is directed to joining of materials where mechanical properties must be maintained. Nonetheless, the Office Action considered that it “would have been obvious to one of ordinary skill in the art that the aluminum alloy of Rhodes may be used as a sputtering target since it is in sheet form and aluminum is a common sputtering target material.”

However, while aluminum may be used in a sputtering target, this does not mean that any aluminum sheets may be used as sputtering targets. Instead, sputtering targets represent a *distinct art* having unique problems; they are required to have a highly uniform composition and metallographic structure, which is not necessarily the case for aluminum sheets, *per se*. Therefore, one skilled in the art would not have considered it obvious to have used the

generic aluminum sheet of Rhodes et al as a sputtering target since there would be no expectation that it would satisfy the uniformity requirements of a sputtering target.

In order to provide structure more clearly distinguishing the sputtering target of the claimed invention from the generic aluminum sheets of the cited prior art, the claims have been amended to further recite that the sputtering target is prepared by butt joining of metal sheets being made of the same “spray formed” material. As already explained, “spray forming” must be considered a structural limitation since it provides distinct structural characteristics to the product, including a more uniform composition as compared to casting or powder molding. Since there is no evidence that the high uniformity provided by spray forming would be present or required in the generic plates of Rhodes et al, it is respectfully submitted that one skilled in the art would not have found it obvious to spray form these plates or to use the plates of Rhodes et al or Pao et al for a sputtering target. It is therefore respectfully submitted that the amended claims define over the cited prior art.

During the interview, Applicants brought to the attention of the Examiners the U.S. patent publication 2002/0153130 (Okamoto et al), which was cited by the Examiner in the copending U.S. patent application 11/946,577 to anticipate corresponding method claims. Okamoto et al discloses a backing plate for use with a sputtering target. According to Okamoto et al (paragraph [0064]), the sputtering target “can be made by any one of brazing, friction stir welding, and electron beam joining.” However, as was discussed during the aforementioned interview, Applicants nonetheless submit that one skilled in the art would recognize that this description represents a translation error and would correctly interpret this as describing that the sputtering target is joined to its backing member by one of these techniques.

More particularly, Okamoto et al is directed to the manufacture of the backing plate for a sputtering target. It is only in paragraph [0064] that the sputtering target is described as

being “made by” FSW. However, this description would make no sense to one skilled in the art since welding, without more, cannot “make” a sputtering target. Therefore, one skilled in the art would recognize that this description is erroneous.

In fact, the underlying Japanese priority applications 2000-390165 and 2001-153962 describe that the sputtering target is *joined to* its backing member by the noted welding techniques, i.e., the phrase “made by” is a translation error. Applicants therefore respectfully submit that one skilled in the art would not draw from Okamoto et al a teaching that it was known for sputtering targets to be comprised of butt joined metal sheets made of the same spray formed material which are joined by FSW, merely that the targets are rejoined to their backing plates by this technique.

Moreover, using FSW to join a sputtering target to a backing plate, as in Okamoto et al, would not have rendered it obvious to have joined plates making up the sputtering plate itself by FSW because FSW provides unpredictable results in joining plates making up a sputtering target. That is, as is explained above, sputtering targets require a high degree of uniformity for producing a uniform sputtered layer. Conventional welding provides joints that lack sufficient uniformity and produce arcing during sputtering. On the other hand, such uniformity is not required for the joint to the backing member, and so the benefits of FSW for joining the plates making up a sputtering plate would not have been expected from using FSW for the joint to the backing member.

The other references cited in copending U.S. patent application 11/946,577 to anticipate the claims are similarly directed to the joining of a sputtering target to its backing member.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early notice of allowability.

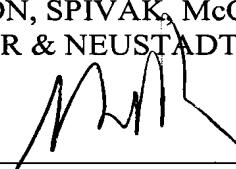
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